

## PATENT ABSTRACTS OF JAPAN

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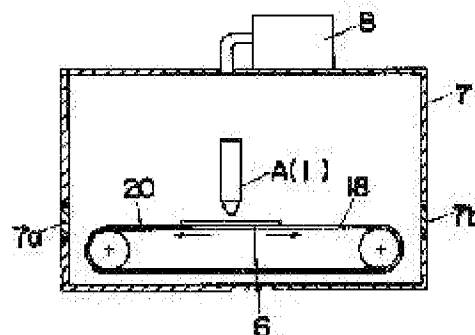
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### (54) PRINTING DEVICE DUE TO INK JET PRINTER

#### (57)Abstract:

PURPOSE: To enhance printing accuracy and printing sharpness by eliminating the effect of a wind.

CONSTITUTION: A printing device is constituted of an ink jet printer applying printing to a material 6 to be printed, a hermetically closed printing chamber 7 receiving the material to be printed and at least the nozzle 1 of the ink jet printer to perform printing and a vacuum device 8 reducing the pressure in the hermetically closed printing chamber 7. A wind is hard to be generated in the hermetically closed printing chamber 7 held to a thin air vacuum state and the possibility receiving the effect of a wind is eliminated. The evaporation speed of the diluent of ink is accelerated in the hermetically closed printing chamber 7 held to a vacuum state to make it possible to accelerate the drying of the ink and the blur of the ink can be prevented.



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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the printer by the ink jet printer to a printed wired board etc.

[0002]

[Description of the Prior Art]On the surface of printed matter, such as a printed wired board and electronic parts, product number and a lot number, In printing a corporate emblem, a care mark, etc. or printing resist, conductive paste, the core of electroless deposition, etc. on these surfaces, it is common that screen-stencil performs conventionally. However, in screen-stencil, the platemaking of a screen is required, and when such platemaking is performed also in the case of small-quantity multiproduct production, there is a problem of working efficiency worsening or becoming a high cost.

[0003]Then, printing by printing on the surface of printed matter using an ink jet printer is proposed by these people. According to the ink jet printer, it is what does not need to use a version and can print by arbitrary Hitoshi Monju according to the input data to the computer, And since an ink jet printer is what prints by flying the surface of printed matter and making ink particles adhere from a nozzle, Since it can print convenient even if a shock is not given to the surface of printed matter like a stylus printer and some unevenness is shown in the surface, it is the optimal as a device printed to printed matter, such as a printed wired board in which the circuit was formed on the surface.

[0004]When printing with an ink jet printer, it is necessary to make a nozzle scan all over printed matter by making it run printed matter at high speed, and moving it relatively, to the nozzle of an ink jet printer.

[0005]

[Problem(s) to be Solved by the Invention]However, when high speed operation of the printed

matter was carried out as mentioned above, the wind occurred with this run and there was a possibility that it might become impossible for the flight direction of the ink particles which fly from a nozzle to printed matter to perform exact printing in response to influence. In order for an ink jet printer to make ink particles and to make it blow off, It was used for viscosity by ink with the diluent, having made it small, after making ink particles adhere to the surface of printed matter, ink permeated printed matter with the diluent, the blot occurred, and there was also a problem that the color definition of printing worsened.

[0006]It aims at providing the printer by the ink jet printer which this invention is made in view of the above-mentioned point, and can eliminate the influence of a wind, can raise the accuracy of printing, and can moreover raise the color definition of printing.

[0007]

[Means for Solving the Problem]A printer by an ink jet printer concerning this invention, The ink jet printer A which prints to the printed matter 6, the printed matter 6, the sealing machine room 7 of the ink jet printer A which prints by accommodating the nozzle 1 at least, and the pressure reducing device 8 which decompresses inside of the sealing machine room 7 are provided.

[0008]

[Function]In order [ of the printed matter 6 and the ink jet printer A ] to print accommodating the nozzle 1 in the sealing machine room 7 at least, and decompressing the inside of the sealing machine room 7 with the pressure reducing device 8 moreover, In the sealing machine room 7 where it is in a reduced pressure state, and air becomes thin even if high speed operation of the printed matter 6 is carried out, it is hard to generate a wind, A possibility of receiving the influence by a wind disappears, and the vapor rate of the diluent of ink can be promoted in the sealing machine room 7 of a reduced pressure state, desiccation of ink can be sped up, and a blot of ink can be prevented.

[0009]

[Example]This invention is explained in full detail according to an example below. As an ink jet printer, it is what can use arbitrary things, such as an electrification deviation type ink jet printer, It is preferred by making a single tier arrange in parallel the nozzle [ a large number (there is also a case of the 1000 maximum numbers) ] 1 especially in this invention, and accommodating in the casing 11 to use the ink jet printer which formed the head A of the multi-nozzle type like drawing 2 (a). The head A of this multi-nozzle type ink jet printer is arranged above the feed gear 18 used as a conveying table. The feed gear 18 is formed by the motors 19, such as a pulse motor, on the band conveyor 20 by which a running drive is carried out, and the head A of the multi-nozzle type ink jet printer is arranged so that the running direction of the band conveyor 20 and the parallel direction of the nozzle 1 may cross at right angles. Although the gutter 5 is arranged along with the slanting lower part of the head A in the example of drawing 2 (a), it may be made to store the gutter 5 in the casing 11 of the head A.

[0010]Drawing 2 (b) shows a theoretic structure of an electrification deviation type ink jet printer, and has illustrated it only about the one nozzle 1 dedicated in the head A. An electrifying electrode and 4 are deflecting electrodes oscillation electrodes, such as a piezo-electric element to which 12 gives vibration to the nozzle 1 in drawing 2 (b), and 3, and the electrifying electrode 3 and the deflecting electrode 4 are accommodated in the casing 11 of the head A. The electrifying electrode 3 is formed in the head A corresponding to each nozzle 1 arranged in parallel, and can also form this electrifying electrode 3 as pin electrodes. [ many ] And the ink sump 13 is connected to each nozzle 1 arranged in parallel in the head A, and it is made to be supplied from the ink sump 13 in the ink 14 at the nozzle 1. If it is in this thing and the ink 14 is supplied to the nozzle 1, when the ink particles 2 which turn into the ink particles 2, blow off from the nozzle 1 continuously in an operation of the oscillation electrode 12, and blow off from the nozzle 1 continuously will pass the electrifying electrode 3, you make it charged selectively. Namely, the ink particles 2 which pass the electrifying electrode 3 when the on-off control of the electrifying electrode 3 is carried out and the electrifying electrode 3 is made one are electrified, When the electrifying electrode 3 is made to turn off, it is made to have electrified the ink particles 2 selectively, as the ink particles 2 which pass the electrifying electrode 3 are not electrified. And when each ink particle 2 passes through between the deflecting electrodes 4, a flying locus is deflected and the electrified ink particles 2. Will not deviate, but will go straight on, the ink particles 2 from which the flying locus was deflected are caught by the gutter 5, and the reuse of the ink particles 2 which have not been charged is collected and carried out to the ink sump 13, The ink particles 2 which are not deflected but go straight on will not be caught by the gutter 5, but will reach even the printed matter 6, such as a printed wired board.

[0011]In the sealing machine room 7 formed in a sealed box etc., the head A which accommodates the nozzle 1 of the above-mentioned ink jet printer, and the feed gear 18 are allocated, as shown in drawing 1, and the pressure reducing device 8 further formed in the sealing machine room 7 with a vacuum pump, a plate fan, etc. is connected. The entrance 7a and the exit 7b which can be closed so that airtightness may be maintained at the anterior part and the rear of the sealing machine room 7, respectively are provided, The printed matter 6 which performs printings, such as a printed wired board, opens the entrance 7a, and supplies and sets it in the feed gear 18, and the printed matter 6 which printing ended opens the exit 7b, and enables it to have taken it out from the feed gear 18.

[0012]As the ink 14 used for an ink jet printer, Solvent dilution type thermosetting resin ink, UV curing type resin ink, etc. are common, and have diluted the ink 14 in the range of 30 to 90 weight section, using organic solvents, such as MEK, ethyl alcohol, methyl alcohol, butanol, and acetone, as a solvent. Although thermosetting resin, such as an epoxy resin, acrylate resin, phenol resin, a urea resin, melamine resin, and polyimide resin, is used as main resin of

the ink 14, it is also possible to use thermoplastics, such as vinyl acetate resin and an acrylic resin. Resin is blended in the range of five to 50 weight section. 5-20 weight-section combination of colorant, such as paints and a color, the bulking agent, etc. can also be carried out as other solid content, and the amount part addition of the electrostatic property grant agent of several [-fold ] can also be carried out further if needed.

[0013]After in carrying out a deer and printing on the surface of the printed matter 6, such as a printed wired board, using the band conveyor 20 of the feed gear 18 as a table, laying it horizontally on it like drawing 2 (a) and setting the printed matter 6, the inside of the sealing machine room 7 is decompressed with the pressure reducing device 8. A decompression degree is suitably set up according to the performance of the pressure reducing device 8, the decompression time-of-onset, required energy, and printing quality demanded, etc., and its range of 750mmHg - 50mmHg is preferred. Since states, such as a spark, will be caused by decompression in an electrification deviation type ink jet printer if electrification pressure is high or deflecting voltage is high, it needs to be based also on this and it is necessary to set up a decompression degree.

[0014]And by making it run the band conveyor 20 with constant speed by the motor 19, The printed matter 6 is passed for the lower part of the head A of a multi-nozzle type ink jet printer with constant speed, In this case, the ink particles 2 are made to blow off from each of all the nozzles 1 which were arranged in parallel and provided in the head A continuously, [ many ] Some ink particles 2 carry out switch control of the electrifying electrode 3, and electrify it, and the gutter 5 is made to catch them by deflecting a flying locus with the deflecting electrode 4 among the ink particles 2 which blow off from each nozzle 1. Other ink particles 2 carry out OFF control of the electrifying electrode 3, and make it not electrify it, and as it is not influenced by the deflecting electrode 4, they make it go straight on, and they make this ink particle 2 made to go straight on arrive at the surface of the printed matter 6. Thus, by electrifying selectively the ink particles 2 which carry out the on-off control of the electrifying electrode 3 of each nozzle 1, and blow off from each nozzle 1, It is what can choose the ink particles 2 which reach the printed matter 6, and can choose the adhering position of the ink particles 2 to the printed matter 6, By making the ink particles 2 adhere to the printed matter 6 selectively in this way, it can print by a desired character and sign, and a pattern, moving the printed matter 6 to the head A with the feed gear 18. Namely, by making the ink particles 2 which blow off from each nozzle 1 of the head A while moving the printed matter 6 to an arrow direction with constant speed, as shown in drawing 3 (a) thru/or (f) adhere to the surface of the printed matter 6 selectively, It can print by a desired character and sign, and a pattern. As for the diameter of ink discharge of each nozzle 1, it is preferred to make it the size of the ink dot to which it is set as 30-150 micrometers, and the printed matter 6 adheres set to 0.1-0.3 mm, and, as for oscillating frequency, it is preferred to set it as 20-200 kHz.

[0015]As mentioned above, in order it is in charge of printing with an ink jet printer, and to perform this printing, decompressing the inside of the sealing machine room 7 with the pressure reducing device 8 moreover in the sealing machine room 7, Even if high speed operation of the printed matter 6 is carried out by the feed gear 18, in the sealing air chamber 4 to which it is in a reduced pressure state, and air is thin, it is hard to generate a wind, and it can print, without receiving the influence by a wind. Therefore, it is lost that the flight direction of the ink particles 2 which fly to the printed matter 6 is influenced by the nozzle 1 in the head A by a wind, the ink particles 2 can be made to be able to reach the printed matter 6 in the exact position made into the purpose, and accurate printing can be performed. The vapor rate of the diluent of the ink 14 will be promoted in the sealing machine room 7 in a reduced pressure state, Desiccation of the ink 14 adhering to the surface of the printed matter 6 can be sped up, the ink 14 can be prevented from spreading in the printed matter 6 by osmosis of a diluent, and the color definition of printing can be raised.

[0016]Although it enables it to print the printed matter 6 in the example of above-mentioned drawing 2 (a) by forming more greatly than the width dimension of the printed matter 6 the print width size (arrangement width dimension of the nozzle 1) of the head A of a multi-nozzle type ink jet printer only by letting the bottom of the head A pass once, When the print width size of the head A is smaller than the width dimension of the printed matter 6, it can print by sending so that it may let the printed matter 6 pass under the head A again after moving the head A crosswise which intersects perpendicularly with the feed direction of the printed matter 6 by the feed gear 18. For example, it can print all over the printed matter 6 by moving the head A 12 times right-angled to the feed direction of the printed matter 6, and carrying out reciprocation moving of the lower part of the bed A for the printed matter 6 at about 600 mm, when the print span according [ the width dimension of the printed matter 6 ] to the head A is 50 mm. Thus, when printing moving the head A right-angled to the feed direction of the printed matter 6, the total distance of a run of the printed matter 6 which passes the bottom of the head A becomes very long. For example, if it prints moving the head A 12 times as mentioned above when the length of the feed direction of 1 of printed matter is 600 mm, the total distance of a run of the printed matter 6 which passes the bottom of the head A will be set to  $600 \text{ mm} \times 12 = 7200 \text{ mm}$ . Therefore, although it is necessary to set the travel speed of the printed matter 6 as the high speed about [ 100 m ] a part for /in this case, and to improve the productivity of printing, As mentioned above, since it is decompressed and is hard to generate a wind, even if the inside of the sealing machine room 7 sends the printed matter 6 in this way at high speed, it can prevent the influence of a wind.

[0017]Although it is made to print by sending the printed matter 6 with the feed gear 18, and moving the printed matter 6 relatively to the nozzle 1 of an ink jet printer in the example of drawing 2 (a), it may be made to move the nozzle 1. In that the ink 14 becomes easy to come

out from the nozzle 1, and load becomes small since the inside of the sealing machine room 7 is decompressed, although it is desirable, since it becomes difficult to stop the ink 14 in the nozzle 1 conversely, The type ink jet printer like drawing 2 (b) which breathes out the ink 14 continuously from the nozzle 1 is preferred. In this case, it is necessary to decompress the course which collects the ink 14 from the gutter 5 to the ink sump 13 with a degree of vacuum higher than the inside of the sealing machine room 7.

[0018]By printing in the sealing machine room 7 which is in a reduced pressure state as mentioned above, Since the ink 14 can be prevented from promoting the vapor rate of the diluent of the ink 14, speeding up desiccation, and spreading in the printed matter 6 by osmosis of a diluent, The selection range of the solvent used as a diluent can be made large, and the safe solvent selection with few public nuisances is attained. In this invention, since the shape of the ink dot which a blot is lost in this way and made to adhere to the printed matter 6 will be in the state of a perfect circle, it becomes easy to be able to print by the stable picture and to print by the still thicker ink layer at the overprint of an ink dot. In order to print in the sealing machine room 7 in a reduced pressure state, the printing ground of the printed matter 6 is stabilized and it can print by being stabilized in the printed matter 6 with various surface state and shape. Since a deviation succeeds even if it becomes possible to prevent them from fine ink particles dispersing on the surface of the printed matter 6 as a satellite, and furthermore adhering to it and makes late discharge speed of the ink particles 2 from the nozzle 1, Even when printing so that between the particles of the ink particles 2 may be overlapped, scattering by the collision of the ink particles 2 in the surface of the printed matter 6 can be prevented, and a printing surface can be finished finely.

[0019]

[Effect of the Invention]The ink jet printer in which this invention prints to printed matter as mentioned above, Since printed matter, the sealing machine room of an ink jet printer which prints by accommodating a nozzle at least, and the pressure reducing device which decompresses the inside of a sealing machine room are provided, It can print without being hard to generate a wind in the sealing machine room where it is in a reduced pressure state, and air becomes thin, and receiving the influence by a wind, even if high speed operation of the printed matter is carried out.

The accuracy of printing can be raised.

In the sealing machine room of a reduced pressure state, the vapor rate of the diluent of ink can be promoted, desiccation of ink can be sped up, and it can print vividly by preventing a blot of ink.

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[Translation done.]